

living room when dust reactions occur. By this I mean the removal of all material of animal origin from those rooms and the substitution of cotton or floss bedding, pillows, mattresses, and rugs. The floor, furniture, woodwork, walls, and curtains should be thoroughly cleaned with damp cloths at frequent intervals. In addition to these measures, desensitization with a mixture of several strongly reacting stock extracts is worthy of trial. Careful questioning of the patient will often indicate susceptibility to house dusts.

If the patient is asked to analyze the effect of various dust exposures, a davenport or chair, rug or coat may be found to be causing specific reactions. If the stock dusts do not react in such patients, special extracts as described by Doctor Lamson from the mixed house dust as well as dusts from special carpets or furnishings should be prepared. As I described in 1927, concentrated extracts can be obtained by just covering about twenty grams of the dust with the extracting fluid and, after two days, draining off this fluid and using it to extract a similar amount of the same dust. I have continued to obtain good reactions in most patients with the cutaneous method. In those patients failing to react to this technique the intradermal method is used.

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SAMUEL H. HURWITZ, M. D. (490 Post Street, San Francisco).—Doctor Lamson's paper presents a very important contribution to an interesting problem in allergy. When Dr. R. A. Cooke of Cornell University reported in 1922 a group of dust-sensitive asthmatics, he concluded that the active principle in the dusts to which they were sensitive contained a specific and unknown substance. This view has been upheld by some workers, and disputed by others. In our experience with dust-sensitive patients we have found two groups to exist. First, one in whom it is possible to demonstrate by careful and exhaustive tests sensitization to many biologically unrelated allergens and a second group who, although markedly sensitive to their own environmental dust, are negative to various animal hairs, pollens, foods, or miscellaneous test substances. We have, therefore, come to the conclusion that house dust extracts contain both specific and nonspecific allergenic substances.

The treatment of dust-sensitive patients is at times spectacular. Where elimination therapy cannot be successfully carried out, desensitization with a specific environmental house dust extract frequently gives excellent results. For the past four years, in the asthma clinic at Stanford Medical School we have had under close observation and treatment an interesting house dust sensitive patient whose history is worthy of brief comment. In 1926 a woman about thirty-two years of age came under our care. The physician who referred her remarked that "Mrs. H. is a terrible sufferer from asthma and nothing but hypodermics of morphin seem to relieve her." In 1923 she was advised to leave her home in Kansas and come to California, where her asthma continued unabated. Many cutaneous tests with the common animal epidermal, pollen, food, and miscellaneous proteins were all negative. Tests to both stock and autogenous house dust extracts, more particularly to the latter, however, gave very large reactions. Careful questioning elicited the information that this patient had brought all of her household furnishings with her from Kansas, so that she was exposed to the same allergens in California as she had been in her home state. Because the patient's economic status precluded any radical changes in her home, such as the removal of furnishings made from animal hairs and the creation of dust-free surroundings, we decided upon a course of desensitization with her own house dust extract. The results of treatment were extremely gratifying. It is now almost four years since treatment was commenced, and during this time the patient has had only several mild asthmatic paroxysms.

We are thoroughly in accord with Doctor Lamson's view that environmental allergens are of great importance in the diagnosis and treatment of many patients with asthma. Wherever tests with house dusts are carried out it has been our practice, where possible, to use extracts obtained from materials in the patient's own environment. These we feel have given us more valuable information than those carried out with stock dusts.

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EDWARD MATZGER, M. D. (909 Hyde Street, San Francisco).—The widespread application of the brilliant work of Dr. R. A. Cooke of Cornell on house dust as a new etiological factor that he published in 1922 brings out the necessity of again emphasizing the fundamental principles as laid down by this original worker.

Doctor Lamson and Virginia Inman in this paper help to cast light on the unknown substances found in most house dust. The trend of recent work in allergy seems to be in the discovery of factors hitherto unrecognized. The work on molds has definitely rescued from this unknown group one additional factor.

The feature which strikes me most forcibly in this article is the emphasis laid to inhalant factors as a cause of bronchial asthma. This etiological group has been much snowed under, in the recent literature, by the occasional spectacular food cases which are reported so much more frequently than factors in the inhalant group.

The fact that positive skin reactions are obtained from these varied specimens of individual dusts in people who are not exposed to them emphasizes the importance of proper interpretation of positive skin tests. Positive skin tests demonstrate both actual and potential mucous membrane sensitiveness. Doctor Lamson points out the importance of clinical trial as the best method of evaluating the significance of skin sensitiveness. This feature is fundamental.

Further investigation along these lines must be encouraged. It is only by these efforts that the many empirically discovered successful methods can be made rational.

LARYNGEAL OBSTRUCTION IN CHILDREN*

REPORT OF CASE

By RULON S. TILLOTSON, M. D.
Woodland

DISCUSSION by Edward S. Babcock, M. D., Sacramento; Barton J. Powell, Jr., M. D., Stockton; Orrin S. Cook, M. D., Sacramento.

MOST instances of laryngeal obstruction in children allow ample time for preliminary investigation before instituting treatment. Time is also usually available for deliberately carrying corrective measures into effect. Occasionally, however, the symptom of dyspnea is of such character that immediate action is mandatory. The prompt institution of treatment in these cases is of life-saving importance.

The procedures of tracheotomy and intubation are employed for the relief of acute laryngeal obstruction.

HISTORY OF THE OPERATION

The first reference to the operation of tracheotomy is in the writings of Asclepiades of the

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* Read before the California Northern District Medical Society at Sacramento, September 30, 1930.

Craeco-Roman period of medicine.¹

The opening of the trachea and larynx in some of the earliest cases was carried out principally for the removal of foreign bodies and for intense angina. Bretonneau in 1825 is credited with having performed the first successful tracheotomy in croup. The history of the development of the operation of tracheotomy is very interesting; however, its review is hardly within the scope of this paper. Intubation of the larynx

in croup was introduced by Bouchut in 1856. O'Dwyer (1840-1898) is given the credit for perfecting the instruments for the operation as it is now performed. It may be added that some physicians at the present time favor direct laryngoscopic introduction of the intubation tube in preference to the O'Dwyer technique.

Familiarity with the symptoms of acute laryngeal obstruction is important. The choice of a procedure for its relief should depend on the causative pathology, and on the period of time that continuation of treatment may of necessity be required.

By way of illustration of these facts an instance of acute laryngeal obstruction, relieved by tracheotomy, and progressing to complete recovery is cited.

REPORT OF CASE

H. D., male, age two, entered the hospital on November 25, 1929, with a diagnosis of pneumonia. Two days before the child had been seen by his mother in the act of swallowing some kerosene. He had a severe coughing spell and vomited immediately after. Gradually increasing difficulty in breathing had been noted from that time until his admission.

On examination the child was restless and showed marked distress on respiration. A loud inspiratory and expiratory stridor was heard. No cyanosis was observed. On exposure of the neck and chest a marked indrawing at the suprasternal notch during inspiration was noted with accompanying retractions in the supraclavicular fossae and the epigastrium.

A diagnosis of acute laryngeal obstruction with threatened asphyxia was made. A tracheotomy was immediately done under local anesthesia, according to Jackson's technique. The dyspnea was at once relieved.

An x-ray taken later of the neck and chest was negative. Subsequent direct laryngoscopic examination showed a marked redness of the entire glottis with swelling of the arytenoids, the region of the false vocal cords, and the subglottic area. No ulcerations or membrane were noted. A culture taken direct from the larynx proved negative for diphtheria. The cause of the laryngeal obstruction as suggested

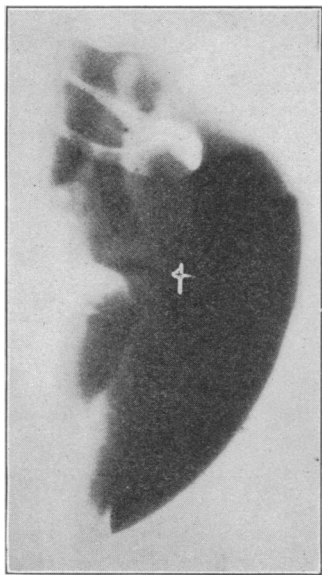


Fig. 1.—Lateral x-ray film of the normal larynx. Cross (x) indicates site of ventricles.

by direct laryngoscopic examination was a traumatic laryngitis from the aspirated kerosene.

Decannulation or permanent removal of the tracheotomy tube was not possible before the twenty-eighth postoperative day. Laryngeal exercises were carried out for several days prior to decannulation before the normal respiratory function of the larynx was re-established. By first changing to a smaller tube, then partially corking the tube, with later complete corking, and gradually increasing the time as the patient allowed it, permanent removal of the tube was finally possible. The tracheotomy fistula closed nicely a few days after decannulation.

Comment.—In this case an x-ray of the chest, laryngoscopic examination, and the taking of a culture were not carried out before a tracheotomy was done. The time necessary for these procedures would probably have been fatal to the patient, but they were later carried out to establish the character and cause of the obstruction.

The marked indrawing at the suprasternal notch as noted in this patient is the outstanding physical sign of acute laryngeal obstruction. The explanation for the indrawing is found in the fact that from the failure of the air to get through the larynx, the negative pressure established by the inspiratory expansion of thorax is not compensated for, and a drawing in of the unsupported soft tissues at the opening of the thorax results. This indrawing at the suprasternal notch, as has been stated by Jackson,² is never seen in the dyspnea of asthma, pneumonia, mediastinal or cardiac disease, unless laryngeal complications are present. As evidence that the significance of this sign is not appreciated the same author states that of 126 patients admitted to his clinic on whom a tracheotomy was necessary, one-half of this number had been diagnosed as asthma or pneumonia.

Cyanosis was not present, although suffocation was impending. Cyanosis should not be waited for as an indication for tracheotomy. The patient may die from exhaustion in his struggle for air, and cardiac failure may occur without the pronounced appearance of this sign. The restlessness was due to air hunger and is an important sign in the diagnosis of acute laryngeal dyspnea.

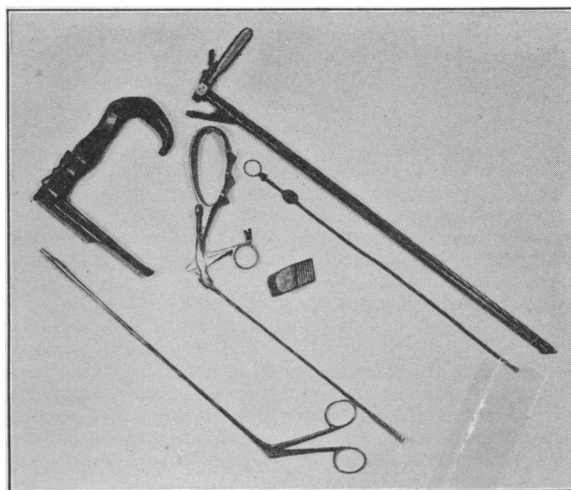


Fig. 2.—Instruments used in direct laryngoscopy.

The stridor was significant, as it was present in both the inspiratory and expiratory phase of respiration, indicating an obstruction to both the entrance and exit of air through the larynx. A similar type of stridor may be present in laryngeal diphtheria with the added factor that the child may not be able to cry, due to the presence of membrane between the cords. An inspiratory stridor with easy expiration and no loss of voice is suggestive of laryngismus stridulus, a condition where tracheotomy is rarely required.

TRACHEOTOMY AND INTUBATION

The selection of tracheotomy in preference to intubation as a measure to relieve the obstruction was due to the opinion that a tracheotomy, by putting the larynx at absolute rest, favored healing of any injury done by the aspirated kerosene. It was felt that an intubation tube inserted into an already inflamed and edematous larynx would excite and increase this inflammation, with a possible subsequent stenosis of the larynx. The fact that the safe removal of the tracheotomy tube was impossible before the twenty-eighth post-operative day rules out the question of intubation in this case. The latter procedure should not be employed where prolonged wearing of the intubation tube is anticipated. Difficulties in extubation and laryngeal stenosis may result from prolonged irritation by the tube. The great majority of laryngeal obstructions in children do not present emergency situations as in the instance cited, but allow sufficient time for making an exact diagnosis before treatment is begun.

The procedures which may be employed as aids in diagnosis are emphasized by the following case history.

REPORT OF CASE

E. J., male, age fifteen months, entered the hospital on February 27, 1930, with the complaint of difficult, noisy breathing. Three days before, the child had developed a croupy cough with accompanying difficulty in respiration. A few hours prior to admission he had a choking spell and became blue. The attack passed off after he coughed up some mucus, which apparently came from his throat. Temperature was 101.2 degrees, pulse 150, respirations 40.

On physical examination the child appeared extremely ill and in a state of prostration. The voice was faint and croupy, and a moderately loud inspiratory and expiratory stridor was heard. On exposing the neck and chest a limited amount of retraction was noted in the suprasternal and epigastric region during inspiration. Cyanosis was not present. The impression was that we were confronted by a moder-

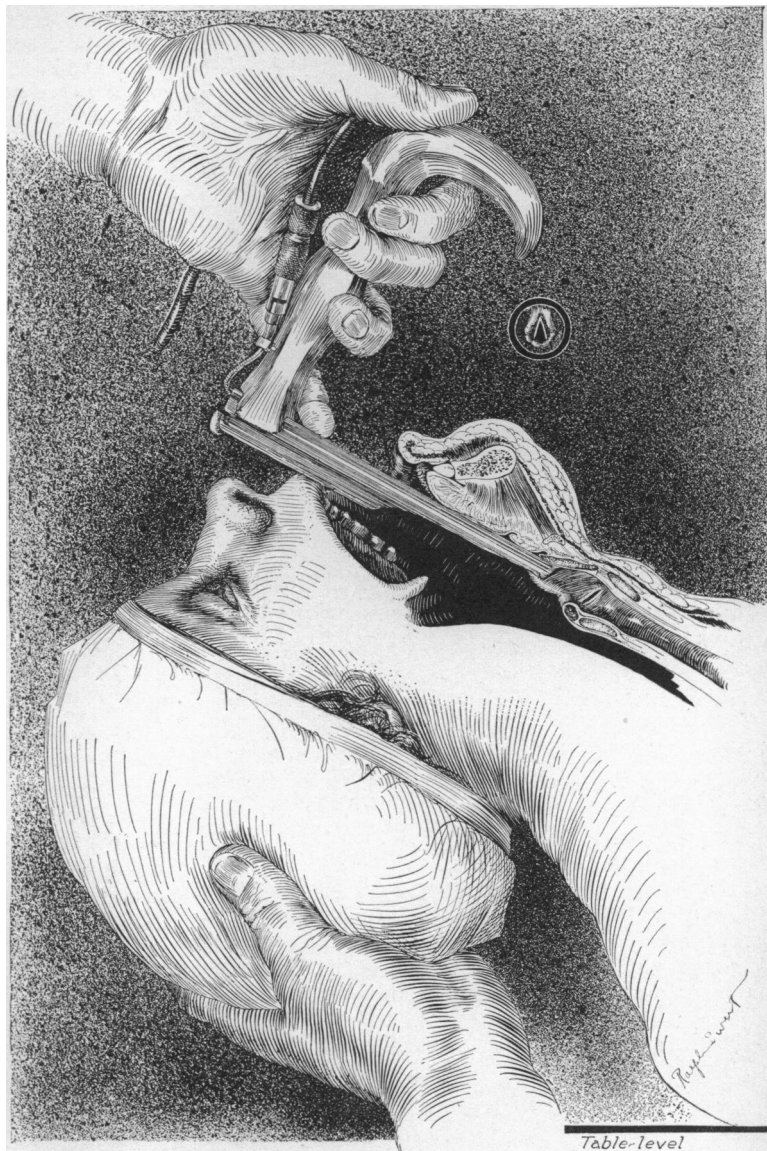


Fig. 3.—Method of direct laryngoscopic examination of the larynx.

ate laryngeal obstruction, probably inflammatory in character; the marked prostration, the relatively low temperature, and high pulse rate suggesting diphtheria. An anteroposterior x-ray of the neck and chest was negative.

A direct laryngoscopic examination was made and a culture taken direct from the larynx. The glottis showed an intense reddening, with the vocal cords approximating poorly on efforts at crying. No ulcerations were noted. No membrane was present above the cords; however, below the cords in the subglottic region considerable tenacious exudate was noted. This was aspirated as thoroughly as possible. Breathing was less labored after this procedure.

The culture taken from the larynx showed the Klebs-Löffler bacillus, whose virulence was later checked by guinea-pig inoculation. Under antitoxin treatment the child recovered without further need of suction or other measures to relieve the obstruction.

Comment.—An anteroposterior x-ray of the neck and chest was negative in this case. Pancoast³ has recently pointed out certain landmarks in the lateral view of the upper respiratory tract that are of diagnostic importance. The lateral view of the normal larynx shows a zepelin-

shaped area of decreased density at the site of the ventricles. This landmark, as pointed out by him, may be obliterated or its outline disturbed in any one of three conditions, namely, cord paralysis, inflammatory conditions, or tumor. Pancoast has also pointed out that the normal width of the prevertebral soft tissues at the level of the laryngo-pharynx is about one-fifth that of the body of the underlying vertebra. Any increase in the width of this shadow, as would be present with a retropharyngeal abscess in this region, is of diagnostic importance. Pictures to demonstrate lesions in and about the larynx are taken laterally during the inspiratory phase of respiration in the child or during phonation in the adult. Since Pancoast's paper was given, we are routinely taking lateral as well as anteroposterior x-rays in our laryngeal cases for the additional information that these films may afford. Figure 1 shows the normal landmarks of the larynx and adjacent structures as referred to in this discussion.

Direct laryngoscopy should be carried out in every case of laryngeal obstruction. This procedure permits inspection of the larynx and the taking of a culture, if indicated, direct from the site of the lesion. Redness, edema, the presence of membrane, tumor, foreign body, and cord paralysis should be looked for. The instruments required for this work are shown in Figure 2. The method of direct examination of the larynx is shown in Figure 3. The use of a direct laryngoscope for the introduction of the intubation tube is shown in Figure 4.

Suction as used through the laryngoscope in this case is often of great value. Thorough aspi-

ration of membrane, secretion, and crusts may eliminate the necessity of intubation or tracheotomy. The use of suction through the laryngoscope in the treatment of laryngeal diphtheria was reported several years ago by Grover and Hardman⁴ at the Willard Parker Hospital in New York City. At the present time it is used in many of the larger hospitals for contagious diseases. Its value was recently cited in a large series of laryngeal diphtheria cases reported by Tolle.⁵ In his report only 18 per cent required intubation where suction was used, while 41 per cent needed intubation where this measure was not employed. Its use is also of value in removing crusts, secretion, and membrane in nonspecific types of obstructive laryngitis.

LARYNGEAL OBSTRUCTION

Detailed case reports could be given, illustrating other types of laryngeal obstruction; however, the review of such cases would be time-consuming and include repetition of many points already amply stressed. For this reason a simple enumeration of the more important causes of laryngeal obstruction, with brief comments on the diagnosis and treatment of each type, is given.

Laryngismus Stridulus.—This condition, sometimes referred to as inspiratory laryngospasm, occurs in infants as a complication of rickets and malnutrition. Sir St. Clair Thompson⁶ believes that the laryngeal obstruction is not due to spasm of the glottis, but to a collapse of unusually feeble laryngeal tissues during inspiration. The total absence of inflammation or membrane on laryngoscopic examination helps to establish a diagnosis in this condition. Tracheotomy is rarely required to relieve the dyspnea. In addition to the employment of measures of relief during the attack, treatment of the associated rickets should be carried out.

Laryngeal Diphtheria. The presence of membrane within the larynx or subglottic region and a positive culture of the Klebs-Löffler bacillus establishes a diagnosis of this condition. The treatment consists of laryngoscopic aspiration, antitoxin intravenously, with intubation or tracheotomy, if needed for threatened asphyxia.

Acute Streptococcus Laryngitis.—Intense reddening and edema of the larynx and often the presence of a dirty white exudate are seen in the laryngoscopic picture of this disease. The edema

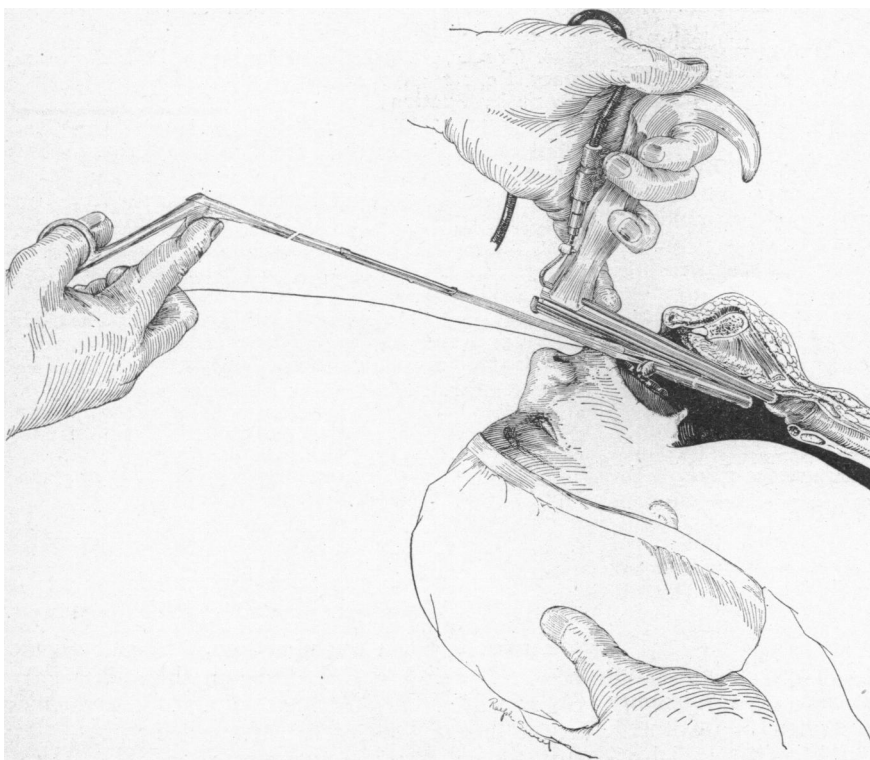


Fig. 4.—Direct laryngoscopic introduction of the intubation tube.

may be present in the subglottic area. A culture of streptococcus, usually of the hemolytic variety, is obtained. The laryngeal condition in these cases is often a part of a severe respiratory infection involving the trachea and bronchi. Although relief of the obstructive laryngeal dyspnea may be called for and obtained by intubation or tracheotomy, the patient often dies due to the severe respiratory infection or one of its complications.

The treatment of these conditions may call for the relief of the laryngeal obstruction by intubation or tracheotomy. Streptococcus serum is used with benefit in some cases. Baum⁷ reports favorable results in the use of foreign protein in the form of mixed respiratory vaccine given early in the course of the disease. In some of the milder cases we have used ephedrin sulphate, hypodermically, every four hours with definite relief of the obstructive laryngeal dyspnea.

Postoperative Edema of the Larynx.—This condition is sometimes seen following bronchoscopy, particularly in infants when the procedure is prolonged. We had such a case develop during the past year, following the successful removal of a foreign body from the right main bronchus. A low tracheotomy was done to relieve the acute obstructive laryngeal dyspnea. Moersch and Boothby⁸ have pointed out the value of oxygen as a prophylactic for postbronchoscopic laryngeal edema in children. Their results seem to warrant its use routinely in these cases.

Laryngeal Tumors.—Papillomata are the most common benign tumors causing laryngeal obstructive symptoms in children. These tumors may be removed endoscopically without anesthesia.

Foreign Bodies.—The diagnosis is made by the x-ray, if opaque to its rays, or by direct laryngoscopic examination. The treatment is removal with direct laryngoscope and laryngeal forceps.

Bilateral Cord Paralysis.—This condition is characterized by firm approximation of the cords in the mid-line on laryngoscopic examination. Unless seen early and relieved by tracheotomy, the patient obviously dies of asphyxia.

A case of bilateral cord paralysis was recently reported by Tucker,⁹ occurring in a child under one year of age. The bilateral paralysis was due to pressure of an enlarged thymus on both recurrent laryngeal nerves. Bronchoscopy, followed by tracheotomy over the bronchoscope to relieve the acute obstruction, and subsequent x-ray of the thymus were the procedures carried out in the treatment of his patient.

Direct laryngoscopic views of the above described conditions are given in Figure 5.

SUMMARY

1. In most instances of laryngeal obstruction in children sufficient time is allowed for making an exact diagnosis before treatment is instituted. X-ray examination of the neck, with special attention to the lateral view, direct laryngoscopic

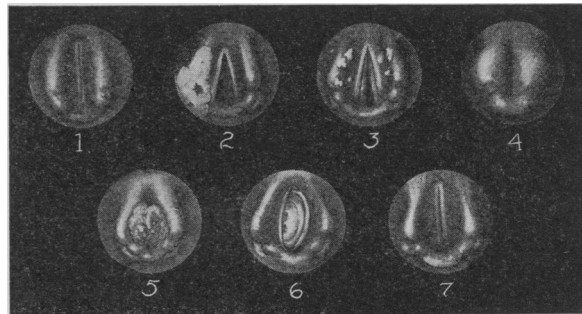


Fig. 5.—Direct laryngoscopic views: (1) Laryngismus stridulus (during inspiration). (2) Laryngeal diphtheria. (3) Streptococcus laryngitis. (4) Acute edema of the larynx. (5) Papillomata. (6) Foreign body. (7) Bilateral (abductor) cord paralysis.

examination, and the taking of a culture, when indicated, should enable one to make a diagnosis.

2. A few cases of laryngeal obstruction in children demand an immediate decision as to the treatment needed and prompt institution of this treatment to prevent loss of life. Recognition of the cardinal signs of acute laryngeal dyspnea is fundamental.

3. An enumeration of the more important causes of laryngeal obstruction in children is given. Brief comments are made on diagnosis and treatment.

Woodland Clinic.

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DISCUSSION

EDWARD S. BABCOCK, M.D. (Medico-Dental Building, Sacramento).—In the presence of laryngeal obstruction, when shall the attending physician call in the laryngologist and how can the need for instrumentation be prevented?

In the past, in moderate degrees of obstruction, common croup or non-diphtheritic laryngitis was usually the diagnosis until proven otherwise, as this was the most common condition seen. If diphtheria was suspected, perhaps ten thousand units of antitoxin were given intramuscularly.

Today, when trained laryngologists are always available, except in the remotest communities, and when our knowledge of diphtheria is more complete, this course seems inexcusable.

Children who have a general respiratory tract infection, with only a moderate laryngeal obstruction which is worse at night and subsides during the day, in most cases can be safely treated as having common croup. But where diphtheria is proven or is likely, large amounts of intravenous antitoxin, warmed, diluted and given slowly are indicated. We have given fifty to one hundred thousand units in several cases with recovery where instrumentation seemed unavoidable at the onset.

Active immunization of our child populace against diphtheria has materially reduced the incidence of laryngeal obstruction, but unfortunately only a very small number of those immunized are followed up with Schick tests to determine immunity.

When in doubt as to the pathology present or the course to pursue in treatment, no time should be wasted in calling the laryngologist.

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BARTON J. POWELL, JR., M. D. (Medico-Dental Building, Stockton).—Fortunately for humanity, cases of laryngeal obstruction in children are becoming less and less frequent. The greatest single cause of this reduction is undoubtedly the early use of antitoxin therapy and prophylactic treatment of diphtheria. This disease is fast becoming an uncommon entity and the severity of those cases which do appear is usually attenuated. As Doctor Tillotson has brought out, direct laryngoscopic examination of all cases of laryngeal diphtheria with asphyxia should be done. By this procedure the exact condition of the structures can be noted, smears taken direct from the laryngeal mucosa and intubation readily accomplished. Intubation by direct laryngoscopy affords a quicker and surer method and will, I believe, supplant the older methods where the field of operation is hidden from view.

A frequent cause of acute laryngeal obstruction in children is the inspiration of foreign bodies. These usually demand immediate action. A foreign body on the aryteno-epiglottic folds, or even in the cavity of the larynx, can often be dislodged with the finger and the patient subsequently expel it by coughing. Care must be taken with this procedure not to force the material through the glottis. In cases where the obstruction is partial and asphyxia is not impending, direct laryngoscopy should be done and the foreign body removed with the laryngeal forceps. Where time and opportunity permits, roentgenograms are often helpful in locating the object.

Doctor Tillotson has stressed the indications and advantages of tracheotomy and I wish to again emphasize the importance of this life-saving procedure. The operation is neither difficult nor serious. There is little operative trauma, and complications are rare. Tracheotomy should be done in every case where asphyxia is impending and where the less radical procedures do not immediately supply the required relief. This excellent operation is only too often regarded as a last-moment attempt to ward off exitus. When the indications are present, perform tracheotomy immediately. Do not wait until the patient is in extremis and thereby severely jeopardize a favorable prognosis.

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ORRIN S. COOK, M. D. (Medico-Dental Building, Sacramento).—Fortunately or unfortunately the roentgenologist has the opportunity of seeing very few cases of laryngeal obstruction. Most of these cases are acute and are diagnosed without waiting for an x-ray examination. Most of the patients whom we see are those where foreign bodies lodge in the larynx. This is comparatively rare, but occasionally does happen. If the foreign bodies are radio-opaque, the x-ray is of considerable assistance, but if they are radio-lucent the x-ray does not help.

The only other condition which I have seen with any frequency is retropharyngeal abscess. This condition in the advanced stages gives a bulging of the posterior wall of the pharynx in the lateral view which is quite diagnostic.

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DOCTOR TILLOTSON (Closing).—I have endeavored in this paper to stress the cardinal signs of laryngeal obstruction and point out the measures at our disposal in determining its cause. The procedures employed in maintaining a patent airway in this portion of the respiratory tract have been given. I agree with Doctor Powell that the operation of tracheotomy is not difficult or serious, with the qualification that the incision in the trachea should always be made below the first tracheal ring, avoiding injury to the cricoid cartilage. Injury to this cartilage may result in chronic laryngeal stenosis. After-care in keeping the tracheotomy tube and trachea clean, using suction if necessary, is of the greatest importance in avoiding post-tracheotomy complications.

BACTERIOPHAGE AS A THERAPEUTIC AGENT IN GENITO-URINARY INFECTIONS*

By E. W. SCHULTZ, M. D.
Stanford University

INTRODUCTION

WILL ROGERS claims that all he knows is what he reads in the newspapers. All I can claim to know regarding the therapeutic merits of bacteriophage in genito-urinary infections is what I have read in the clinical reports sent to my laboratory. Whether the source of my information is any more reliable than that of Will Rogers' is problematic. Despite this uncertain status of my knowledge your program committee has had the courage to invite me to dispense something more or less authoritative on a singularly intricate question—has bacteriophage a place among therapeutic agents of value to the urologist? I must admit at once that I have failed to bring you a categorical answer to this question. To some this may represent the equivalent of a negative reply, but this is not necessarily the case. With any therapeutic procedure which does not yield uniformly successful results—and these are rare—one should not allow himself to be led astray by the failures which may initiate or sprinkle an inquiry. A procedure may have inherent merits, but these may not be fully revealed until the various factors which influence the result have been determined and, if possible, brought under control. Though we recognize that Nature yields up her secrets with great reluctance, we are often apt to draw conclusions long before the evidence is in. Indeed, some of us find the path a little too irksome and are inclined to seek a way out in logic whatever the original premises may perchance happen to be. We cannot escape the fact, however, that, while people may argue indefinitely (as it is said they once did) as to

*From the department of bacteriology and experimental pathology, Stanford University, California.

*Read before the Western Branch of the American Urological Association, November 6, 1931.